Signed soliloquy: visible private speech

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Short Title:

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Abstract

Talking to oneself can be silent (inner speech) or vocalized for others to hear (private speech, or soliloqui). We investigated these two types of self-communication in 28 deaf signers and 28 hearing adults. With a questionnaire specifically developed for this study we established the visible analog of vocalized private speech in deaf signers. "Signed soliloquy" is employed regularly and valued as an integral part of everyday functioning. Deaf signers were also found to engage in inner speech frequently and in a mostly positive context. Together, the findings demonstrate a significantly more frequent use of both inner and private speech in the deaf sample. They underscore the benefits of self-talk in general and provide the first-ever description of an intriguing phenomenon in deaf signers' self-communication, i.e. signed soliloquy.

Research on Sign Language has been rapidly growing over the past decades. However, to our knowledge, one feature of sign language has been badly neglected, i.e. inner speech and its variants. Talking to oneself is not limited to inner speech but can be expressed, in hearing individuals, as audible private speech or soliloquy. But how does one talk to oneself if one cannot hear one's own words? Is there an analog to audible private speech that deaf signers might engage in? This study provides evidence for a form of private speech in deaf signers that is visible to others. We dub this visual analog of audible soliloquy "signed soliloquy" and illustrate its potentially beneficial implications for daily functioning.

Self-communication

The disentanglement of the relation between thought and language remains a challenge. Moreover, this relation appears somewhat ambiguous with regard to self-communication. Do we talk silently to ourselves when thinking? Does thinking count as self-communication when only addressed to oneself? Are thoughts necessarily restricted to words? Can they also be expressed with signs, especially when used for self-communicating purposes?

While some of these questions remain open, others can be answered by reference to Vygotsky's extensive research. With his book "Thought and Language" he provided his profound view on self-communication (Vygotsky, 1934). While he identified the coming together of talking and thinking on a preverbal level as a specific type of communication, which he called "private speech", he defined talking silently to oneself as "inner speech" (Vygotsky, 1962). According to him, private speech represents a stage of the internalization of linguistic exchanges with the final ontogenetic destination of inner speech (Fernyhough & Fradley, 2005). Thus, ways of talking to oneself can adopt different forms such as engaging in a silent self-dialogue without anyone noticing (inner speech) or as self-communication that is not directed to another individual but is possible for others to hear (private speech) (Kronk, 1994; Fernyhough & Fradley, 2005).

Inner speech. We use inner conversation so often that we rarely seem to notice it anymore. As a part of our everyday experience, inner speech is a key component of our being (Fields, 2002). Since inner speech is so much a part in our daily lives, it comes as no surprise that this familiarity results from a process which had its beginning in early childhood. With the focus on the development of children, Vygotsky (1962) suggested that self-communication fulfils a necessary function for healthy human development, especially between the ages of three to eight. First a form of audible private speech, it is later transformed into silent inner speech. Fernyhough (2004) elaborated the concept of self-communication and its development from private speech to inner speech. Accordingly, inner speech is the result of a process of internalisation of dialogues that begins with the child's first encounters with spoken exchanges. Vygotsky's and Fernyhough's views of self-communication as a dialogue are supported by other researchers such as Fields (2002) and Fernyhough and Fradley (2005). Even though internalized speech has undergone structural changes it keeps its dialogic character. Inner speech is therefore often equated with thoughts and described as a collective term of utterances that fulfil different functions such as self-instruction, anticipation, self-awarding, and self-punishing (Tönnies, 1994). According to Fields (2002), inner speech serves even more purposes such as using the inner voice for silent repetition of words which is supportive of learning processes or for reflective deliberation when making decisions or planning actions by silently formulating its necessary steps. In addition, inner speech is beneficial to engaging in inner conversations while including different perspectives on a topic or for staying focused on a problem-solving task. Meichenbaum (1978) agrees with Field's (2002) view that inner speech plays an important role in influencing behavior. Often the nature of thoughts in stressful moments appears not only to be automatic but also plausible in its evaluating character. What we say to ourselves might inadvertently determine how we act. However, Meichenbaum (1978) endorses his statement with the fact that a crucial element in behavioral change is not only speaking to oneself but also listening to oneself. In this regard, he points out the human ability to generate self-statements that help guide one's actions. Hence, he relied on this competence of self-instruction when establishing the

inoculation training (1985) to reduce stress in overwhelming situations. Moreover, as a tool for stress prevention Meichenbaum (1978) claims the benefits for individuals trained in consciously initiating inner speech to enhanced adaptive coping strategies. However, this internal dialogue is not only relevant for the process of changing behavior but also has effects on cognitive structure. With this „executive processor“ Meichenbaum (1978) implies an organizing aspect of one's mental functioning that seems to monitor and direct the route and choice of thoughts. Accurately, the cognitive structure he refers to is by definition the source of the scripts from which inner speech draws its essence.

Private speech. Flavell (1966) first employed the term "private speech". The psycholinguist Wertsch (1979) recommended using the concept of private speech rather than egocentric speech in order to avoid confusion with speech that is used in an egocentric way in verbal interactions. By definition, private speech occurs spontaneously and is overtly vocalized (Duncan & Cheyne, 1999). It is described as such because it stays private and is not obviously addressed to another listener. Alternative terms for spontaneous audible, yet self-directed verbal utterances involve overt self-talk, self-verbalization, self-directed speech or soliloquy. To elaborate the concept of private speech and to distinguish between inner and private speech, reference is commonly made to the four-stage model of the development of inner speech by Fernyhough (2004). At Level 1, children and their caregivers interact in characteristic give-and-take of normal conversations, the so-called external dialogue. At level 2, children take on these dialogues and transform them into open private speech, meaning they talk out loud to themselves until they gradually sub-vocalize their talking to themselves. At level 3, private speech becomes fully internalized but the silent talk to oneself still resembles normal give-and-take conversations and is therefore called "expanded inner speech". At level 4, the inner speech has condensed, meaning the semantic and syntactic abbreviations leave the once external dialogue at the stage of "thinking in pure meanings" described by Vygotsky (1987).

However, while children employ audible private speech uninhibited, fear of being considered mentally ill by others may prevent adults from engaging in this type of self-communication. Furthermore, Kronk (1994) suggested that as children grow older, they become more aware of social rules, one being that one should not talk to oneself. In her study with adolescents, the author found the occurrence of private speech to be profoundly affected by observers in social situations and suggested similar outcomes for adults potentially engaging in private speech. Hence, without creating an atmosphere where social behavior is not under scrutiny, private speech would not be shown.

While Vygotsky (1962) proposed a limited time frame during childhood for the employment of private speech, several authors (Duncan & Cheyne, 1999; 2002; Berk & Garvin, 1984; Berk & Potts, 1991; Kronk, 1994) reported its frequent use well into the elementary school years and adulthood and hence are not in agreement with his view of private speech going "underground" in the preschool years (Fernyhough & Fradley (2005). They argued contrarily that adults not only apply private speech but also use it for the same purpose as children, namely for planning and organizing, analyzing tasks, for problem solving, commenting on outcomes of actions, and as a tool for emotional discharge as Vygotsky puts it. Thus, private speech, or soliloquy, may be beneficial in many ways across lifespan. It reportedly serves cognitive and attentional processes by supporting spatial orientation, manual dexterity and organizational tasks (Fuson,1979; Duncan & Cheyne, 1999; Fernyhough & Fradley, 2005). John-Steiner (1992) classified different functions of soliloquy, such as the verbal exploration of a problem or a situation, confirming utterances or questions or commenting on statements by others. Private speech may therefore serve a checking function („Do I have everything?"), assist in action planning („Let's see, where was I?", „What' s next?") or play a role in self-monitoring („Just keep quiet now!"). According to the meta-analysis by Hatzigeorgiadis, Zourbanos, Galanis and Theodorakis (2011), the literature on self-communication has provided strong indications that private speech is an effective strategy for supporting learning and enhancing performance. However, the authors could demonstrate that participants – when given a choice - preferred inner speech over private speech as self-talk strategies for

enhancing skill acquisition. It seems that self-directed speech, whether it is silent or audible, continues to serve intra-psychological purposes such as self-regulation of behavior throughout adulthood.

Against this theoretical background on self-communication and especially considering the different aspects of inner speech and private speech, we set out to explore the issue of self-communication in deaf individuals familiar with sign language.

Aims of This Study

To our knowledge this study is the first to pursue the question whether deaf signers employ a visible analog to audible private speech. By developing a specific questionnaire, we chose an explorative approach to investigating and comparing ways of self-communication of deaf signers and hearing individuals. The goal of this study was thus to capture a sense of deaf signers' engagement in silent self-communication (inner speech) and to investigate whether signed private speech exists at all and, if yes, whether it may be beneficial to everyday functioning.

While inner speech can adopt positive and negative components, we expected compared to hearing individuals to find more positive inner speech in the deaf sample based on the assumption that deaf individuals might benefit from self-encouragement due to less favorable environmental conditions and that positive inner speech might be one of the applied and adaptive coping strategies in a hearing world. In addition, we expected to find deaf signers to engage in self-addressed Sign Language, as a way of communicating to themselves assuming that both signed and spoken soliloquy engender similar benefits.

Method

Participants

A total of 56 participants took part in the study, 28 hearing and 28 deaf adults. Roughly a third of all participants were students and the level of education was similar in both samples.

The hearing participants were recruited at two universities in Switzerland (Fribourg and Zurich) and by word of mouth. Deaf participants were reached through advertisements on internet platforms and in a class of prospective Sign Language teachers in Zurich. The participants' age range was 21 - 70 years (M = 43.14, SD = 15.56) with men older than women (men: M = 55.75, SD = 15.02; women: M = 38.10, SD = 12.78). The gender distribution was the same in hearing and deaf participants: 8 men and 20 women in each group. Table 1 provides an overview of demographic variables of the deaf sample with information concerning the hearing status of their upbringing families, the onset of deafness, the time of acquisition of Sign Language and the preferred language used when engaging in Sign Language. All participants provided written informed consent before participating in the study, which was conducted in accordance with the declaration of Helsinki (1964) and had been approved by a local Ethics Committee of the University Hospital Zurich.

Table 1 about here

Measures

Inner speech. All participants were administered the "Inventory on self-communication for adults (ISE)" by Tönnies (1982). This German language self-report questionnaire of inner speech is based on the presumption that the way people talk to themselves is characteristic of their attitude and feelings towards themselves. Its use is intended for research in clinical and health psychology, in education science or as a tool in psychotherapeutic interventions. Regarding negative inner speech, discriminant analyses have determined highly significant differences between mentally disturbed and healthy individuals. In addition, established consistency coefficients for each scale have ranged from .67 to .88. Retest reliabilities were between .74 and .89 (Tönnies, 1982). The 38 items appear on a 4-point Likert-scale ranging from 0 (never) to 3 (frequent). The questionnaire consists of six scales; three scales about

positive self-communication (complacence about oneself, self-courageousness, positive mental state) and three scales about negative self-communication (discontentment about oneself, self-discouragement, negative mental state). Table 2 describes the single scales and their composites in more detail.

Table 2 about here

Private speech. The “Visible private speech scale (VPSS) for deaf signers” provides a self-report assessment of private speech. The instrument was developed specifically for the present study and consists of 45 items which are rated on a 4-point Likert scale 0 (never) to 3 (very often). The first 22 items were selected to capture a range of activities where visible private speech could arise. They refer to specific situations, which comprise the control of one’s actions, the rehearsal of newly acquired information, the reading of a complex text, work at a computer, moments of self-reflection and the experience of a highly emotional state (feeling reproachful, happy, angry, frustrated, sad). Furthermore, nine items ask how signed soliloquy is used (intact sentences, single words, mainly for swearwords when agitated), and one item explored whether one was ever observed to sign during sleep. Finally, the last 14 items assess potential benefits of signed soliloquy (e.g. stress reduction, improving concentration, acting more efficiently, enhancing visualization, or self-guidance). Deaf signers also responded to questions regarding the employed language for signed soliloquy, its frequency, the onset age of their hearing loss, the number of years of communicating in Sign Language, and if they grew up in a family with only hearing or deaf family members or in a mixed hearing-deaf environment.

The VPSS has been designed in the style of the “Self-Verbalization Questionnaire (SVQ)” by Duncan and Cheyne (1999) developed to assess self-directed audible private speech in

hearing individuals. Its first 22 items relate to three factors of the SVQ which measure vocalized private speech in behavioral-organizational, cognitive-attentional, and affective contexts. Each of these scales of the SVQ proved high internal consistency with .83, .78, and .77 and significant test-retest reliabilities (behavioral-organizational .84, cognitive-attentional .71, and affective .74). In order to validate our own questionnaire (VPSS) we had the deaf sample fill out the SVQ as well by translating it into German and by replacing the verb “talk to myself” with “sign to myself”. Furthermore, we compared the scores of the same number of items within each category of both questionnaires. The items for each scale of the VPSS and SVQ including means and standard deviations are listed in table 3. T-tests (two-tailed) for dependent samples revealed no significant differences between the two questionnaires (behavioural-organizational $t(27) = -.17$, $p > .05$; cognitive-attentional $t(27) = -.71$, $p > .05$; affective $t(27) = .42$, $p > .05$). Hence, we assumed that our instrument has psychometric properties comparable to those of the well-validated SVQ by Duncan and Cheyne (1999). The second half of the questionnaire was purely of explorative character and provided further insights into the employment and contexts of signed soliloquy such as whether deaf individuals tend to be aware of signing to themselves as well as other details including sign amplitude, duration, and avoidance of signed private speech.

For comparative reasons, the 28 hearing participants were also administered both Self-Verbalization Questionnaire (SVQ) and the analog of the VPSS for hearing individuals.

Table 3 about here

Procedures

A short medical history was conducted to exclude past or current presence of neurological and psychiatric illnesses, including learning disorders and substance abuse (adopted from a brief neuropsychiatric interview; Campell, 2000). If eligibility criteria were met, the

participants were tested at their convenience in Zurich, Fribourg or Bern. The participants who filled out only the questionnaires that were put online were contacted by email. The same material was used for all participants, with adapted versions for both samples when indicated. The 28 hearing individuals filled out the questionnaires either in paper and pencil versions or online. Recruitment of deaf individuals was via contact on the internet platform "deafzone", by putting the questionnaires online and spreading the link to several organizations and associations. The suitable reading level for filling out the questionnaires was met by all participants although neither reading nor writing skills were explicitly explored in advance. For questions concerning the understanding of the questionnaires, the authors were always available either in person or by email.

Results

Inner speech. Since variance differed across groups for inner speech (Levene's test; $p < .05$), a Welch's t-test was performed and group differences were significant with $t(43.3) = 4.28$; $p < .001$. Figure 1 shows that deaf individuals employed significantly more often positive inner speech than hearing individuals. Following Cohen's convention (1988), the effect size was large with $r = .50$. Whereas the comparison for negative inner speech proved not to be significant ($t(54) = 1.37$, $p > .05$), the difference of the total of employed inner speech (positive plus negative) was again highly significant (more frequent use of inner speech in the deaf participants; $t(54) = 3.94$; $p < .001$). Effect size was large ($r = .47$).

Fig. 1 about here

Private speech. Signed soliloquy and audible private speech were compared with one another using t-tests (two-tailed) for independent samples (deaf vs. hearing). Whereas deaf participants filled out the VPSS especially designed for them, the hearing sample answered

to the adapted version in which “sign to myself” was replaced by “talk to myself”. For the deaf sample, the results of early learners (< age 6) and late learners (> age 6) of Sign Language were highly similar, and data were thus collapsed across these two groups. Signed soliloquy was used frequently by deaf signers with only one deaf participant indicating not to employ it. Figure 2 indicates higher scores on all scales of the VPSS for the deaf compared to the hearing sample (behavioral-organizational $M = 9.29$ vs. $M = 5.32$; cognitive-attentional $M = 10.46$ vs. $M = 8.11$; affective, $M = 17.79$ vs. $M = 11.54$). A robust difference in favor of deaf signers was found in behavioral-organizational contexts ($t(54) = 3.66$; $p = .001$). Moreover, the deaf sample reported significantly greater use of private speech in cognitive-attentional contexts ($t(54) = 2.15$; $p < .05$) as well as in affective contexts ($t(54) = 3.56$; $p = .001$). According to Cohen’s convention (1988), the effect sizes for the behavioral-organizational contexts and affective contexts were large with $r = .44$ and $r = .43$, respectively. In the cognitive-attentional contexts, a medium effect size ($r = .28$) could be established.

Figure 2 about here

The last 23 items of the VPSS revealed insights worth mentioning, even if based on largely exploratory questioning. For instance, some deaf participants employed signed soliloquy frequently to entertain themselves or to feel less lonely. While a few used the same amount of space when signing to themselves as when communicating with others, most of the deaf signers engaged in smaller hand movements for private speech. Some individuals reported having been told that they used signed soliloquy while sleeping. Preferred language for signed soliloquy was Swiss German Sign Language (DSGS), and the estimated engagement of signed soliloquy ranged from five minutes to three hours a day. All deaf participants reported to avoid using signed soliloquy when staying in public places. When asked to give

examples of private speech, one deaf participant mentioned she would sign “pasta” when going into the kitchen to cook pasta. Signing to themselves while cooking was reported by several deaf signers. One individual recalled signing his problems when feeling overwhelmed at work. One other person reported that he would engage in signed soliloquy especially when angry or frustrated. Another deaf inividual recalled that she would sign her thoughts to herself while being on hikes. Furthermore, one deaf woman described that she would sign to herself when looking at herself in the mirror in the morning or when having picked the wrong item at the grocery store. One person mentioned signing songs to herself when in need of encouragement.

Discussion

While private speech, that is soliloquy, has been studied with neurophysiological and neuroimaging techniques in healthy and clinical populations (e.g. Girbau, 2007), we believe that no respective research has ever been conducted in deaf signers to date. In fact, the present study is the very first to document the mere existence of private speech in deaf signers. We propose to label it "signed soliloquy" because, unlike in hearing subjects, it is expressed by manual sign, not by verbal utterance. Although perhaps not surprising in retrospect, the finding that deaf signers engage in signed soliloquy could not have been predicted on the basis of available data. In fact, our deaf participants not only reported to use signed soliloquy but to employ it significantly more frequently than hearing individuals report to talk to themselves aloud. In all contexts, the results demonstrated significant differences in the functions of private speech across groups. Hence, our hypothesis that deaf signers engage in signed soliloquy received clear support by the present investigation. Even more so since its use seems to exhibit resourceful ways of handling the many daily demands. The multifaceted benefits of engaging in signed soliloquy are unveiled especially by the explorative part of the “Visible private speech scale (VPSS)” for deaf signers. Whereas analyzing problems seemed to trigger signed soliloquy in many deaf signers, a number of individuals also claimed to talk to themselves in signs when anticipating conversations with

others. A few reported to engage in signed soliloquy when feeling lonely, bored, or during a moment of self-reflection. Such examples were given by several deaf individuals and illustrate a high automaticity. Therefore, signed soliloquy cannot be viewed solely as memory strategy or concentration enhancement in very specific and rare situations but rather, in a broader sense, as an overall self-guiding tool for supporting daily activities.

Our findings also demonstrate a significant difference in the frequency of use of positive inner speech. Again, as predicted, deaf individuals clearly rely on the benefits of inner speech more regularly than hearing individuals do. This may be due to their pronounced need for self-encouragement in the face of being deprived of auditory input and having to deal with mostly ignorant surroundings. Thus, positive inner speech might be one of the sensible coping strategies of deaf individuals in a hearing world. On a global level, inner dialogue might simply be more important when deaf, and especially of value when employed in an affirmative way.

The study has some limitations that deserve to be mentioned. Participants' age range was considerable and the varying duration of Sign Language experience may have affected the results. Furthermore, our findings represent self-report data which suffer from the intrinsic weakness of introspection. However, even if the results of the present exploratory investigation may be regarded as preliminary, they add to the discussion concerning the distinction between thought and (unspoken) language and contribute to the current understanding of self-communication. We assume that comments addressed to oneself, whether silent or overt, vocalized ore signed, engender similar benefits and are to be viewed as an adaptive strategy for everyday functioning.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Figure 1

Mean scores of the three scales of the “Inventory on self-communication for adults (ISE)” for deaf participants (dark bars) and hearing participants (light bars). *** = $p < .001$. Error bars are standard errors around the means.

Figure 2

Mean scores of the questionnaire “Visible private speech scale (VPSS)” for deaf participants (dark bars) and the adapted version for hearing participants (light bars). * = $p < .05$; ** = $p = .001$. Error bars are standard errors around the means.

Table 1

Demographic variables assessed of 28 deaf signers

Variables of interest		N
Hearing status of family, mainly	Deaf	5
	Hearing	15
	Mixed (deaf/hearing)	8
Hearing loss		
	Congenital	20
	Acquired	8
Acquisition Sign Language		
	Early learners (< age 6)	17
	Late learners (> age 6)	11
Language		
	Swiss German (DSGS)	6
	German (DGS)	19
	English (ASL)	2
	Other	1

Table 2

The six scales of the ISE, including the derived measures of positive, negative, and total inner speech

ISE 1: Complacency about oneself, 7 items. Utterances that express self-confidence, e.g. „That went really well.“
ISE 2: Discontentment about oneself, 8 items. Utterances that express disregard, e.g. „What ever I do seems wrong.“
ISE 3: Self-courageousness, 6 items. Utterances that have a positive effect on oneself, e.g. „Everything will be ok.“
ISE 4: Self-discouragement, 4 items. Utterances that have a negative effect on oneself, e.g. „I think I will not make it.“
ISE 5: Positive mental state, 6 items. Utterances that describe general well being, e.g. „I am feeling contented.“
ISE 6: Negative mental state, 7 items. Utterances that describe general indisposition, e.g. „I am feeling lousy.“
Positive inner speech: Positive self-communication, 20 items (ISE 1, 3 and 5). It captures the parts of positive self-communication.
Negative inner speech: Negative self-communication, 18 items (ISE 2, 4 and 6). It captures the parts of negative self-communication.
Total inner speech: Total of self-communication, 38 items (Positive and negative inner speech). It captures the total of intrapersonal self-communication.

Table 3
Items of VPSS and SVQ used for validation

Questionnaire	Category	Items	M (SD)
VPSS	Behavioral-organizational	- When following instructions of a manual - When trying to organize my thoughts - When controlling my actions - For self-reflection purposes - When watching TV - When working at the computer	9.29 (4.60)
SVQ		- When playing computer or video games - When putting away documents - When organizing something - When having to clear up a mess under pressure - When handling unfamiliar equipment - When reflecting if I performed well	9.11 (4.01)
VPSS	Cognitive-attentional	- When trying to memorize something - When doing calculations - When analyzing a difficult porblem - When anticipating the steps of a planned action - When planing a conversation with another person	8.82 (3.10)
SVQ		- When trying to solve a complex problem - When trying to concentrate when distracted - When studying for an exam - When trying to memorize a phonenumber - When correcting a text I have just written	8.21 (3.40)
VPSS	Affective	- When being angry and frustrated - When being pleased and happy - When blaming myself for something	5.71 (2.24)
SVQ		- When trying not to get angry - When excited or frustrated - When disappointed	5.96 (2.52)

Figure 1

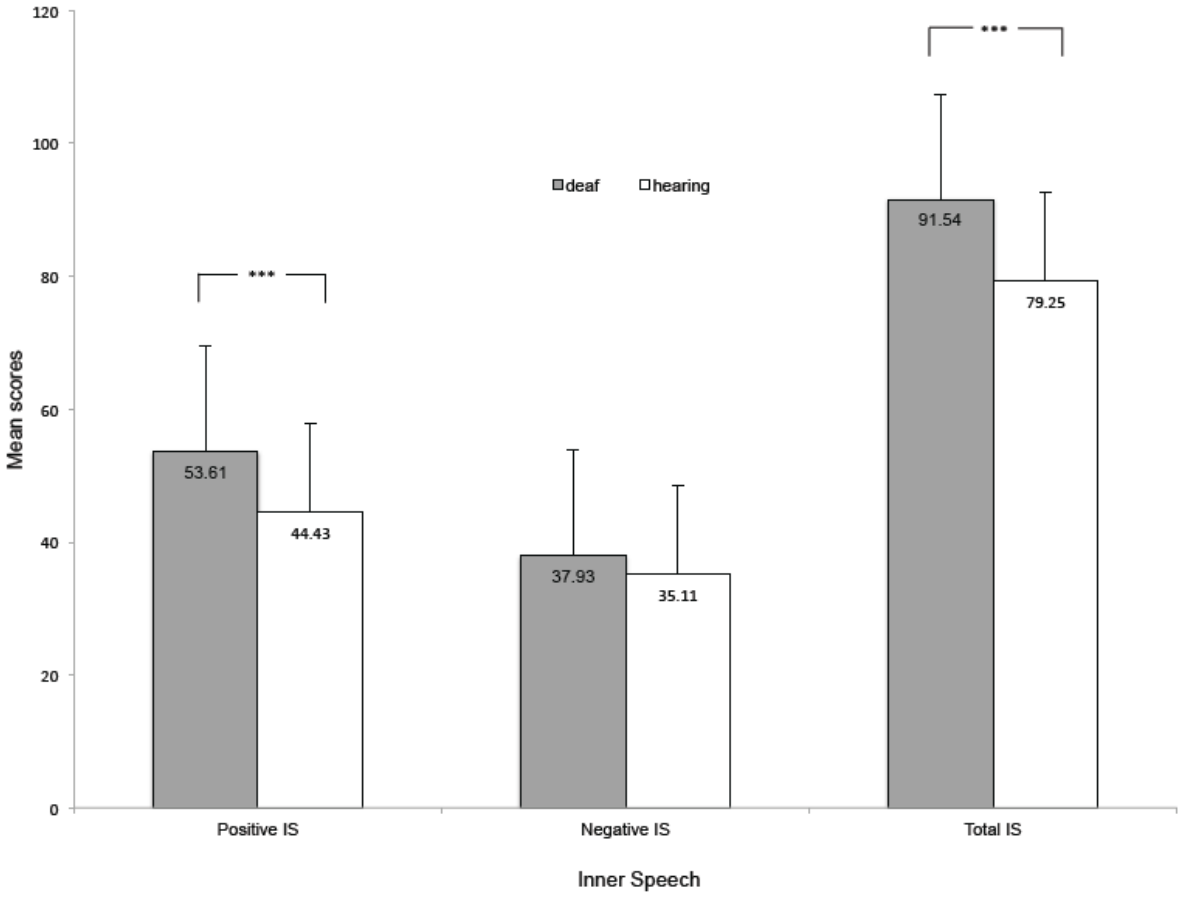
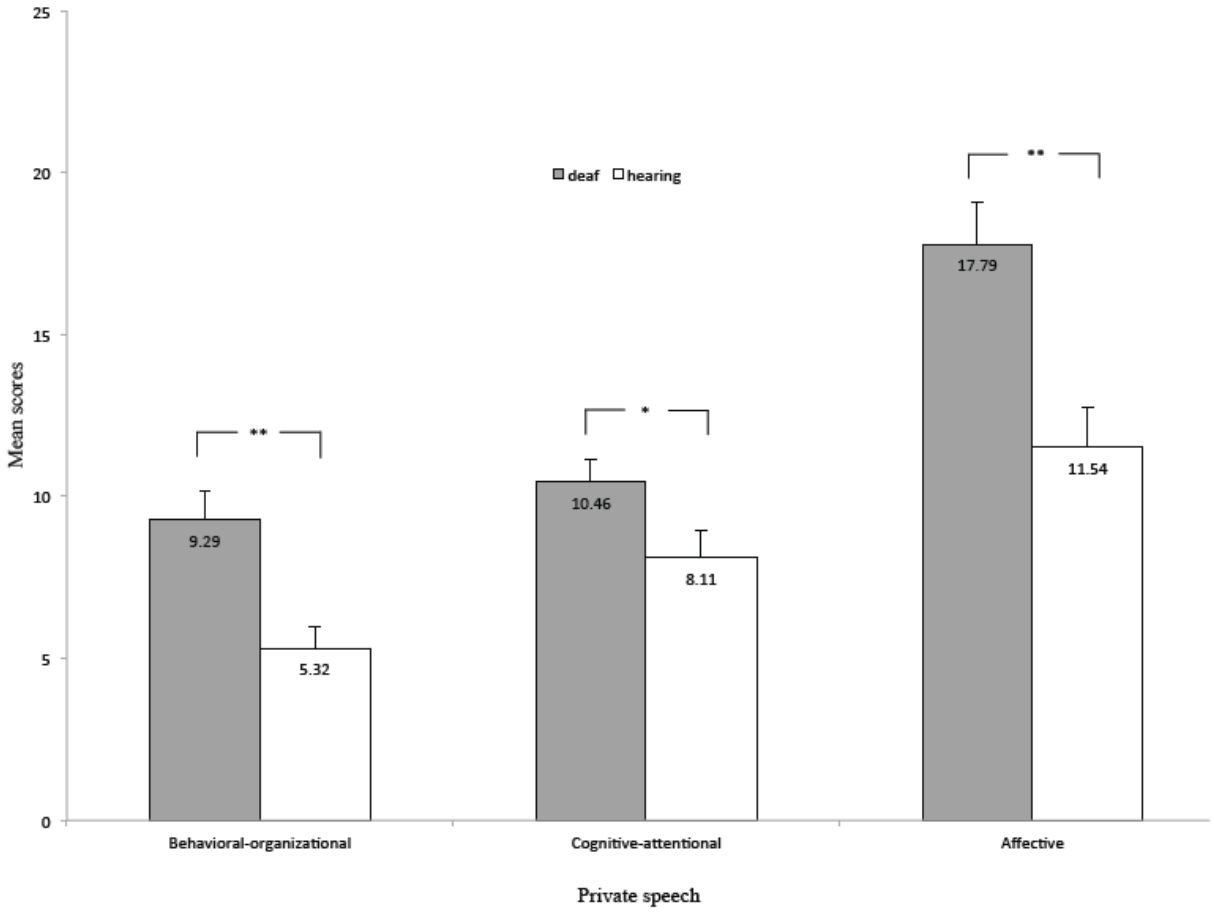

120
100
80
60
40
20
0
Mean scores
deaf
hearing
***
***
53.61
44.43
37.93
35.11
91.54
79.25
Positive IS
Negative IS
Total IS
Inner Speech

Figure 2


25
20
15
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Mean scores
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9.29
5.32
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17.79
11.54
Behavioral-organizational
Cognitive-attentional
Affective
Private speech